

T² Bulletin

A Newsletter of the Local Technical
Assistance Program (LTAP)

Are You on the Right Road to Year 2000 Compliance?

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On the third day of January, when you return from your New Year's holiday about 16 months from now, what will work in your department and what won't? Computer experts predict many levels of problems with the Year 2000 changeover.

The most optimistic believe problems will be scattered and fleeting. Others see complete doom and gloom. One recently recommended keeping eight months worth of supplies, equipment, and cash on hand.

How are departments of transportation doing in the battle to get old, two-year digit programming bugs changed to four-digits in time? When you look at the federal government level of readiness, you could easily become discouraged. In a chart published by *TechWeb*, *The Technology News Site* on the Internet, Mary Mosquera reports that the U.S. Department of Transportation has 630 total systems. The current estimate is that only 35 percent of these systems will be compliant by March of next year. She reports that complete compliance will be achieved in 2004. It's no wonder that a report card of federal agencies, also published by Tech Web, gives the Department of Transportation an F.

Township, city, county, and state highway agencies vary widely in their readiness to face the new millennium. To check on this, *Better Roads'* editors e-mailed a questionnaire about compliance to system's chiefs in various offices.

In Mississippi, John Simpson, Information Systems, says that the agency will be compliant before July of 1999. Current steps include adding two newly developed (and compliant) systems, one for accounting, and one for transportation asset management. These make up a large part of the agency's automated business processes. Some smaller systems will be modified to reach compliance. Testing is part of the program. The agency isn't really querying suppliers about their compliance at this point.

Connecticut DOT's Thomas J. Perrone, Information Systems Administrator, says their mainframe assessment will be completed shortly. "We have prioritized the systems to be repaired. The critical legacy applications will be completed and compliant by July 1999. The majority of PCs will be replaced



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through our NT migration project, and will be compliant." PC software upgrades will ensure compliance in that area, Perrone reports.

Don't assume that all recent system or software upgrades will do the trick. For instance, Microsoft's NT 4.0 operating system is *not* fully compliant. NT 5.0 will be, or there is a patch, called Service Pack 3, for NT 4.0 that you can download. You also need to install Microsoft Site Server Express 3.0 and Windows NT Year 2000 QFE Fixes. Windows '95 also has some problems, if you use specific applications. Windows '98 or on-line upgrades should let you fix those problems. The Microsoft Website includes more information and is a must-visit if you use NT or Windows.

The Connecticut DOT took steps about two years ago to ensure that suppliers are compliant. The department inserted compliance terminology in all agreements with vendors, consultants, and construction contractors.

Perrone says they are currently testing systems with embedded logic. Telephones, security systems, elevators, and heating and air-conditioning systems are compliant.

Louisiana is on much the same track for basic compliance with a July 1999 completion date slated. The agency is testing changes, exchanging Y2K information with other agencies and financial institutions, as well as with the Federal Highway Administration. Embedded logic issues in operational systems are being addressed, says Acting Director Dominic Cali.

Leo Luthchansky, Information Systems Manager, ASD/IS, in the Arkansas State Department of Transportation replies that they are in the midst of a Y2K project, managed by the Governor's Office of Budget and

Management. "Processes include the typical ones of inventory, assessment, remediation, and testing," he says. "We haven't entirely completed this process, though we expect to have our critical systems compliant by the time January 1, 2000 rolls around."

Arizona's DOT will be ready by July 1, 1999, says Katie Underwood Murphey. "It's imperative to have the support of the user community as you fix, upgrade, or replace various computer systems," she says. "The key to delivering a successful system is to get the user involved in the process."

Smaller agencies, such as counties, rely more on personal computers than mainframes. Many chose to deal with Y2K problems by replacing the computers and software.

"Our systems are already compliant," says IT Manager Tito Olazabal in San Mateo County, California. "Updating of our equipment to a pentium architecture and running tests on new configurations have done it for us."

In Franklin County, Washington, Guy F. Walters says that systems are currently 85 percent compliant and that the rest will be so by the first quarter of next year. Testing and supplier compliance are part of the program.

Taking the Right Steps

You should be well along in your own compliance program at this point. Even so, new software products, insurance, and other helpful tools can make your life easier.

Start by expecting to spend more than you originally planned. Many estimates have doubled or tripled from the first figures. At the federal levels, Y2K readiness is now expected to cost \$5 billion, for instance.

The later you started, the more the program will probably cost. Programmers who could repair the two-digit code and insert four-digits were relatively inexpensive before businesses and government agencies realized that changes would be needed to turn the century. Today, their time costs much more.

Software products can do some of the work an individual programmer might have done for you, but you need to leave time to test. Managers in companies marketing such software recommend one to three months for testing.

IBM recently launched Year 2000-ready DOS. A study showed that between 120 million and 150 million people still use DOS on their desktops, not including those using Windows 3.1 with its DOS component. Versions of DOS older than 6.0 haven't been tested for compliance, says Robert Rapuano, DOS development manager. So, IBM engineers created the new version to solve the problem. Costs for the program are low — \$59 each for multicopy licenses, \$70 on a floppy, and \$65 on a CD.

Check your software for any program that does projections, such as budgetary or highway or bridge life-cycle projections. A testing program can be useful if the data must be absolutely dependable.

E-mail is another area to check, albeit a minor one. "You shouldn't take the vendor's word for compliance," says one computer engineer. "Instead, test it yourself." The newest versions of Microsoft Exchange Server, Lotus Notes, and cc:Mail are Y2K ready. Earlier versions may not be. IBM's Profs, Lan-based cc:Mail6.x, and earlier systems are not compliant.

Testing Testing

Testing tools provide essential help on the path to compliance. Cyrano, for example, now sells the Y2K testing tools developed by Digital Equipment. These support Digital's Alpha, Intel, and VAX-based platforms running Open VMS, Digital Unix, and Windows NT operating systems. The tools don't come cheap. The Millennium Record sells for \$10,000 per server. DateWarp costs \$10,000 for two servers per site. The complete Millennium Test package sells for \$52,000.

Mercury Interactive has visual testing tools that lets programmers track progress in compliance. The software is designed for AS/400 and mainframe platforms. Its QuickTest 2000 support Windows 95 and Win NT. This software is sold as part of its WinRunner 2000 Enterprise and Testsuite 2000 Enterprise. The cost of the component is \$5,895. WinRunner 2000 costs \$11,790.

Peritus Software Services checks code to be sure all date fields have been expanded. Users send the code to the company, where it is checked at the cost of \$0.15 per line of code.

Peritus uses its Automate:2000 software. This scans mainframe COBOL code as well as RPG and PL/1 code and finds the date fields and calculations affected by the Y2K problem.

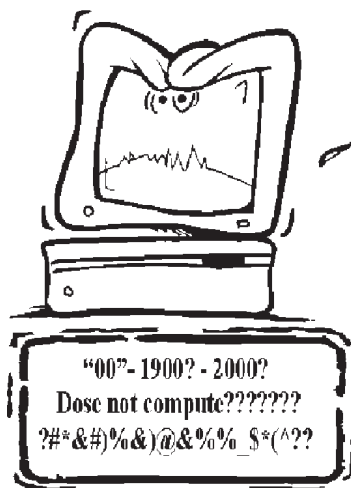
Backup Plans

Even if you believe your own agency has no remaining Y2K problems, consider contingency plans. A TechWeb report by Tim Wilson with *InternetWeek*, says that about 57 percent of applications will not be repaired before date problems begin to cause failures. Some of these will belong to your suppliers, he says, which means problems for you. If their noncompliance and resulting system crash means you can't get parts for a critical snow plow in the middle of the winter, for instance, you need to know what you'll do about it.

Several agencies report that they've developed a team to brainstorm possible solutions if and when problems occur. If you try this route, ask

yourself what you'd do if the phones didn't work for an extended period of time, what you'd do if many stop lights shut down or operated incorrectly, how you'd deal with failure of an elevator or heating system to function, or where you would get maps and needed data if electrical power failed and you couldn't use your compliant computer systems. What would you do without internal communications; without external communications? What would happen if your engineers got irrational data?

There is even a software program that can help you create contingency plans. Called RiskTrak, the Risk Services and Technology program assesses possible problems, their probability, and the likely cost of failures. Insurance policies also provide some protection and can do more than pay back money that was lost. Many of the policies are tied to using compliance programs and testing specified by the insurance company. Once you do this, costs for failures not caught are covered. Ascent Logic is an engineering company that helps Marsh and McClennan write Y2K policies. They begin with an audit that determines the primary policy and then rank the order of systems to be fixed first. They use quarterly audits to assure changes are on schedule. •



Y2K Mystery, Myth, or Mayhem

By Roger Chappell, Technology Integration Specialist

You hear a lot about Y2K these days, but what is reality? Is this a dooms day scenario, or a non-issue? The truth is no one knows for sure the full extent of the problem nor the total impacts. Dubbed "Y2K," "Year 2000," and the "millennium bug" the problem is simply the inability of most computer chips and software programmed with dates as two-digit years to compute a date of "00" when the year 2000 occurs. I can't speculate on all the possible impacts that this event could have on you and your agency, but I can share with you some of the things that WSDOT is doing to minimize its effects on their system. This is the first article in a series designed to update you on Y2K issues as they unfold throughout the coming year.

First, the bad news. This is a real event with potentially very serious ramifications for the unprepared. No one can accurately predict its total impact even though many will speculate and render an opinion. Now the good news. You have some control. This is an event that can be planned for and the effects minimized through the proactive efforts on your agency's part. How much you are prepared will directly determine the impacts it has on you and your agency.

Most people think of this as a PC and software related problem. The problem is much broader than that. I would like to focus this article on "embedded chips" and their role in the problem. For many years now, vendors have incorporated embedded logic chips or integrated computer (IC) chips into many of the gadgets that we surround ourselves with. These gadgets can be as simple as your VCR and the ability to program the machine to record on its own, or as complicated as a nuclear power plant and all the monitoring systems. Some of them may be as simple to fix as adjusting the date on your VCR, but others are far more complex. For example, how do you adjust the date in the "black box" that operates your car?

There will also be some that you will have no control over like the ones embedded in equipment and systems of those who supply services to you such as the telephone company, power company or even your local gas station. This is when a good contingency plan becomes critically important.

To build this plan you will need to identify and prioritize your "mission critical" functions, and the systems and equipment that could be vulnerable to the Y2K "bug." Next, you will need to identify what problems exist and where they occur by checking each one to see if they will function properly with a year 2000 date. Lastly, you will need to correct the problems or develop solutions around them.

The following check list was provided to WSDOT by Beth Le Mieux Glander, Data Dimensions, Inc. to address Y2K embedded chip compliance within the Department. You may find it helpful in the first step to identify areas of potential problems within your own agency. We have also provided a work sheet as an example to assist you in developing your own risk assessment.

On the Lookout for Embedded Systems That May Cause Year 2000 Problems

- I. Begin your analysis with a visual inspection of your instrumentation.

The following are questions to be asked that will help you in identifying devices with embedded systems that may cause year 2000 problems.

1. **Does the system display or print a date or time?**

This would indicate some type of date function is integral to the operation of the device.

2. **Does the system produce regular reports?**

If reports are generated by the device, and dates are part of the report, there may be a problem.

3. **Does the system store historical records?**

If dates are stored, they may also be manipulated and stored.

4. **Does the system time-stamp data?**

If a system date-stamps records, logos or products, it will likely be dependent on utilizing a date that may not be able to handle the year 2000.

5. **Does the system implement a timed sequence?**

If the system starts or stops a function based on date or time, it may have a problem. Consult with the manufacturer to see if a real time clock, oscillator or crystal device performs this function. If an oscillator or crystal performs it, there

probably is not a problem; if a real time clock is involved, continue investigation.

6. Does the system perform an operation on a time or date basis?

Systems that perform a function based on a date or time such as locking doors on weekends depend on the correct date.

7. Does the system perform a calculation based on the differences between time or date?

Systems that determine intervals, averages or total times could be at risk for year 2000 problems.

8. Does the system request the date/time on a start-up?

When power is turned on, a system dependent on a date may request it's input.

9. Does the system send date or time information to other systems?

If a system receives date information from other systems, it may have a date problem. Systems that must synchronize themselves with other systems will typically be dependent on knowing the exact date and time.

10. Does the system receive date or time information from other systems?

If it does not have a date problem, it may be dependent on another system that does.

11. Does the system have a command that allows the date to be set?

If the device or system allows a date to be input, there is likely a need for a correct date.

12. Does the system know which day of the week is based on a particular date?

For example, if the system can tell that June 1, 1998 is a Monday, then some kind of calendar function exists, and consequently a year 2000 problem is likely.

13. Does the system generate an alert based on some type of interval?

If a system creates some kind of notification based on an elapsed period, an elapsed time counter may be involved, which has no date problem, but a real time clock may also be

involved, which does. It is difficult to know which is being used, so these systems are suspect.

(Note: we just assessed the Navistar and Cummins engine and discovered from the manufacturer that although this notification sequence does occur, it is a crystal device performing this function, **not** a real time clock. We are still working with the manufacturers to certify their contention).

14. Does the system display or print data based on a time sequence?

Logs or listings of events by date or time indicate a dependency upon knowing the correct date.

15. Is there an internal battery that might power a clock/date?

An internal battery may power a time device with a non-compliant year value (two digits).

16. Is there a requirement to have the device on all of the time?

If there is an internal clock in the microprocessor that has a non-compliant year-value, it could require that power be supplied to maintain the date on a continuous basis-another indicator of non-compliance.

17. Does the manual mention dates?

Check the manual to understand the instrumentation, paying attention to any date information. Study the functionality of the unit. Also note the support web page, page number and address of the vendor.

18. Does the device indicate by a tag or label that there is a microprocessor present?

An organization doing a walk through of their facility did not see a digital display on a Trane Air Conditioner; however, when the manager removed the panel, there was a metal tag found, indicating that a microprocessor was inside the air conditioner.

Preliminary Conclusion:

This concludes your preliminary "visual inspection." Ask yourself, "are preliminary results indicating the instrumentation microprocessor is not sensitive to date year-values?" If you have answered "no" to these

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questions at this point, you may be rather certain that the unit has no year dependency. Still, you could check additional sources to reduce risk. If you answered “yes” to any of these questions, for a specific device, it should be considered suspect.

II. Contact Your Vendor and Test the Instrument

1. If you have answered “yes” to any of the questions in Section I, see if the year is represented by “four digits.”

If yes, this is a good sign! It may be year 2000 compliant.

It would be a good idea to establish a file to store all the information you collect regarding the status of your systems and equipment. This evaluation should be included with any other information you have collected through other verification methods (e.g., talking to other users, outside consultants, etc.).

If the year is represented by “two digits” or you desire to do further testing, continue with the following steps.

Note: Use extreme caution when proceeding to the following step. Be sure to involve your vendor or manufacturer.

Make sure that your warranty does not prohibit you from performing the test yourself. (i.e., the device is proprietary and only the manufacturer or vendor may perform test). Also, verify with the vendor that there are no restrictions in resetting the clock to year 2000 for testing.

2. Having verified that further testing is okay, perform the following test:
 - set the date to the next century
 - perform any necessary functions for dates beyond year 2000
 - verify that the dates tested are all of those needed for each device (i.e., some may need to be tested for more than January 1, 2000 and leap year).

III. Analyze the Results and Formulate Your Conclusions

1. The best scenario is to find that the microprocessor is fully year 2000 compliant. If the device is found to be compliant, document

the “compliance” and move on to the next category of equipment.

2. If the equipment is found to be non-compliant, document and plan to upgrade or replace the device.
3. If you are in the gray area of uncertainty, your task is to move in one direction or the other. You need to continue efforts to verify year 2000 compliance or decide to replace the unit, if its value warrants it.
4. Considerations may indicate that you need to look for another vendor and replace the unit (replacement may take priority over upgrading the equipment if the vendor has gone out of business and cannot provide the upgrade).
5. **IMPORTANT.** Do not forget about contingency plans (workarounds). You should develop these even for critical items that have been found to be compliant or **will** be compliant, as well as items for those where there is not enough resources and/or time to fix. This is critical to provide assurance that business operations will continue due to unexpected problems that may arise within your agency as well as to be prepared for possible interruptions due to system failures or supply interruptions from external sources that aren't as prepared as you.

Contingency plans could include manual override procedures for water and sewer operations, back-up generators to drive pumps and communications systems (which also need to be checked for Y2K compliance), identifying multiple sources of suppliers, e.g., fuel sources, establishing back up communications procedures, etc.

For each component, answer the following by checking either “yes,” “no,” or “unknown.”

(Note: descriptions of questions are available.)

If you have any questions or comments on this article, please contact:

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(360) 705-7539
Email: chapper@wsdot.wa.gov

Component ID: _____

Question	Yes	No	Unknown
1. Does the component display or print a date and/or time?			
2. Does the component produce regular reports?			
3. Does the component store historical records?			
4. Does the component time-stamp data?			
5. Does the component implement a timed sequence?			
6. Does the component perform an operation on a time or date basis?			
7. Does the component perform a calculation based on the difference between time or date?			
8. Does the component request the date/time on a start-up?			
9. Does the component send date or time information to other systems?			
10. Does the component receive date or time information from other systems?			
11. Does the component have a command that allows the date to be set?			
12. Does the component know which day of the week is on a particular date?			
13. Does the component generate an alert based on some type of interval?			
14. Does the component display or print data based on a time sequence?			
15. Is there an internal battery that might power a clock/date?			
16. Is there a requirement to have the device on all of the time?			
17. Does the manual mention dates?			
18. Does the component indicate by a tag or label that there is a microprocessor present?			

Y2K Questions Related to Traffic Signal Operation

*Darlene Sharar, Technology Transfer Engineer
WSDOT-NWT² Center*

The WSDOT Traffic Office has been working on identifying possible difficulties that Y2K could create for traffic signal operations and solutions for them. Bob Hoover, Traffic Operations Engineer, is the WSDOT Y2K contact for traffic related items. Bob has offered his assistance to anyone that asks, his phone number is (360) 705-7985. For those with Internet access, he can also be reached via e-mail at: hooverb@wsdot.wa.gov.

Here are a few questions we asked him regarding his evaluation of Y2K and signal operations:

Q. What effect will Y2K have on traffic signal operation?

A. We do not expect that there will be any serious adverse effect to traffic signal operation

Q. What have you done to bring yourselves to this conclusion?

A. We have had our Electronics Technicians run tests on various types of control equipment. We have also sent letters to our traffic signal control equipment suppliers requesting that they certify that their control equipment has been tested for Y2K related problems and that there should not be foreseeable difficulties.

Q. Are there any operational problems related to Y2K that could affect traffic signals?

A. Yes; it is possible that traffic signal arterial coordination could be affected. We currently have two types of signal coordination in operation, the first is called "Time Based Coordination." This type of operation depends on the individual time clock of each signal within a coordinated system being synchronized exactly. This means that if the micro processor in the controllers cannot recognize the year 2000 coordination within the system, then it will malfunction.

The second type of coordination we have is "interconnected coordination." This type of system operates using a communications system supervised by a system "master." The master directs the individual intersections in what to do and when to do it. If the year 2000 date causes the master or individual controller microprocessors to malfunction the coordination between the signals will also not operate properly.

It is important to note that in both of the last cases the net result is an operational problem resulting in less efficient service, not a major catastrophic event.

Bob has surveyed the major suppliers and vendors of signal equipment to determine Y2K compliance of equipment and potential operations difficulties. Letters were sent to McCain Traffic Supply, Northwest Signal Inc., Intersection Development Corp., Econolite Review, Cascade Signal Corporation, Eagle Control Systems, Advanced Traffic Products and Capital Enterprise and Engineering. From their responses Bob has compiled a list of information, by manufacturer, on a variety of traffic control equipment including controllers, user software, conflict monitors, loop detectors, external logic packages, switch packs, DC isolators, AC isolators, discriminators, relays, and display panels. For each of these items he has identified the brand name, model name, likelihood of a micro processor/embedded chip, any anticipated problems, any corrective action required, vendor letter, and vendor response.

On pages 9 and 10 is a copy of the current listings. It is also available electronically on the Internet at:

http://www.wsdot.wa.gov/TA/Mgt_Systems/safety.htm

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Year 2000 Traffic Control Equipment Evaluation

August 17, 1998

	Brand	Models	Likelihood of Microprocessor or Embedded Chip	Antici- pated Problems	Corrective Action	Vendor Response
ECONOLITE REVIEW						
CONTROLLER	ECONOLITE	ALL	YES	NO	NA	YES
USER SOFTWARE	NA	NA	NA	NA	NA	NA
CONFLICT MONITOR	ECONOLITE	ALL	POSSIBLE	NO	NA	YES
LOOP DETECTOR	VARIOUS	ALL	NA	NO	NA	YES
EXTERNAL LOGIC PACKAGE	ECONOLITE	ALL	NA	NA	NA	YES
SWITCH PAKS	ECONOLITE	ALL	NO	NA	NA	YES
DC ISOLATORS	NA	NA	NA	NA	NA	NA
AC ISOLATORS	NA	NA	NA	NA	NA	NA
DESCRIMINATORS	3M	ALL	NA	NA	NA	YES
RELAYS	VARIOUS	ALL	NA	NA	NA	YES
DISPLAY PANEL	ECONOLITE	ALL	NA	NA	NA	YES
INTERSECTION DEVELOPMENT CORP.						
CONTROLLER	TRACONEX	ALL	YES	NONE	NONE	YES
USER SOFTWARE	NA	NA	NA	NA	NA	NA
CONFLICT MONITOR	VARIOUS	ALL	POSSIBLE	NONE	NONE	YES
LOOP DETECTOR	VARIOUS	ALL	NA	NONE	NONE	YES
EXTERNAL LOGIC PACKAGE	IDC	ALL	NA	NA	NA	YES
SWITCH PAKS	IDC	ALL	NA	NA	NA	YES
DC ISOLATORS	NA	NA	NA	NA	NA	NA
AC ISOLATORS	NA	NA	NA	NA	NA	NA
DESCRIMINATORS	3M	ALL	NA	NONE	NONE	YES
RELAYS	ALL	ALL	NA	NA	NA	YES
DISPLAY PANEL	TRACONEX	ALL	NA	NA	NA	YES
EAGLE CONTROL SYSTEMS						
CONTROLLER	EAGLE	ALL	YES	NONE	NONE	YES
USER SOFTWARE	EAGLE	170	NA	Yes (BITRAN)	REPLACE	NA
CONFLICT MONITOR	VARIOUS	ALL	POSSIBLE	NONE	NONE	YES
LOOP DETECTOR	VARIOUS	ALL	NA	NONE	NONE	YES
EXTERNAL LOGIC PACKAGE	EAGLE	ALL	NA	NA	NA	YES
SWITCH PAKS	EAGLE	ALL	NA	NA	NA	YES
DC ISOLATORS	EAGLE	170	NA	NA	NA	NA
AC ISOLATORS	EAGLE	170	NA	NA	NA	NA
DESCRIMINATORS	3M	ALL	NA	NONE	NONE	YES
RELAYS	ALL	ALL	NA	NA	NA	YES
DISPAY PANEL	EAGLE	ALL	NA	NA	NA	YES
CASCADE SIGNAL CORP.						
CONTROLLER	CASCADE	ALL	YES	NONE	NONE	YES
USER SOFTWARE	NA	170	NA	Yes (BITRAN)	REPLACE	NA
CONFLICT MONITOR	VARIOUS	ALL	POSSIBLE	NONE	NONE	YES
LOOP DETECTOR	VARIOUS	ALL	NA	NONE	NONE	YES
EXTERNAL LOGIC PACKAGE	CASCADE	ALL	NA	NA	NA	YES
SWITCH PAKS	CASCADE	ALL	NA	NA	NA	YES
DC ISOLATORS	NA	NA	NA	NA	NA	NA
AC ISOLATORS	NA	NA	NA	NA	NA	NA
DESCRIMINATORS	3M	ALL	NA	NONE	NONE	YES
RELAYS	ALL	ALL	NA	NA	NA	YES
DISPAY PANEL	CASCADE	ALL	NA	NA	NA	YES

	Brand	Models	Likelihood of Microprocessor or Embedded Chip	Antici- pated Problems	Corrective Action	Vendor Response
ADVANCED TRAFFIC PRODUCTS						
CONTROLLER	NA	NA	NA	NA	NA	NA
USER SOFTWARE	NA	NA	NA	NA	NA	NA
CONFLICT MONITOR	NA	NA	NA	NA	NA	NA
LOOP DETECTOR	NA	NA	NA	NA	NA	NA
EXTERNAL LOGIC PACKAGE	NA	NA	NA	NA	NA	NA
SWITCH PAKS	NA	NA	NA	NA	NA	NA
DC ISOLATORS	NA	NA	NA	NA	NA	NA
AC ISOLATORS	NA	NA	NA	NA	NA	NA
DESCRIMINATORS	3M	ALL	NA	NONE	NONE	YES
RELAYS	NA	NA	NA	NA	NA	YES
DISPAY PANEL	AN	NA	NA	NA	NA	NA
CAPITAL ENTERPRISE & ENGINEERING						
CONTROLLER	SAFTRAN	ALL	YES	NONE	NONE	NO
USER SOFTWARE	YES	170	NA	Yes (BITRAN)	REPLACE	NA
CONFLICT MONITOR	EDI	ALL	POSSIBLE	NONE	NONE	NO
LOOP DETECTOR	VARIOUS	ALL	NA	NONE	NONE	NA
EXTERNAL LOGIC PACKAGE	NA	ALL	NA	NA	NA	NA
SWITCH PAKS	PDC	ALL	NA	NA	NA	NA
DC ISOLATORS	GDI	NA	NA	NA	NA	NA
AC ISOLATORS	GDI	NA	NA	NA	NA	NA
DESCRIMINATORS	3M	ALL	NA	NONE	NONE	YES
RELAYS	ALL	ALL	NA	NA	NA	NA
DISPAY PANEL	CEE	ALL	NA	NA	NA	NA
McCAIN TRAFFIC SUPPLY						
CONTROLLER	McCAIN	ALL	YES	NONE	NONE	NO
USER SOFTWARE	YES	170	NA	Yes (BITRAN)	REPLACE	NA
CONFLICT MONITOR	EDI	ALL	POSSIBLE	NONE	NONE	NO
LOOP DETECTOR	VARIOUS	ALL	NA	NONE	NONE	NO
EXTERNAL LOGIC PACKAGE	NA	ALL	NA	NA	NA	NA
SWITCH PAKS	PDC	ALL	NA	NA	NA	NA
DC ISOLATORS	GDI	NA	NA	NA	NA	NA
AC ISOLATORS	GDI	NA	NA	NA	NA	NA
DESCRIMINATORS	3M	ALL	NA	NONE	NONE	YES
RELAYS	ALL	ALL	NA	NA	NA	NA
DISPAY PANEL	McCAIN	ALL	NA	NA	NA	NA
NORTHWEST SIGNAL INC.						
CONTROLLER	TST	ALL	YES	NA	NA	NO
USER SOFTWARE	NA	NA	NA	NA	NA	NA
CONFLICT MONITOR	EDI	ALL	POSSIBLE	NONE	NA	NO
LOOP DETECTOR	VARIOUS	ALL	NA	NA	NA	YES
EXTERNAL LOGIC PACKAGE	TST	ALL	NA	NA	NA	NO
SWITCH PAKS	TST	ALL	NA	NA	NA	NO
DC ISOLATORS	NA	NA	NA	NA	NA	NA
AC ISOLATORS	NA	NA	NA	NA	NA	NA
DESCRIMINATORS	3M	ALL	NA	NONE	NONE	YES
RELAYS	ALL	ALL	NA	NA	NA	YES

SWIBS Conversion to WSBIS Will Cause Mainframe Shut Down Earlier Than Previously Planned!

*Greg Kolle, PE, Bridge Engineer
WSDOT-TransAid*

After our NBIS trip with FHWA we saw enough differences in the codes between the two, actually three, systems that a much earlier cut off date is required than June 30, 1999. We are going to ask everyone to get their inspection code updates into WSDOT for the 1998 inspections by Friday, February 12, 1999. We will be shutting down the mainframe on Friday, February 26, 1999.

The word is SWIBS will not survive another inspection season. This brings up a lot of questions. What does this mean to those who must inspect and report their inspection findings to WSDOT? How are the owners of bridges going to report their findings and use the documentation to manage our bridges? If we must change to another system, can we streamline the reporting (code uploading and downloading) and obtain our WSBIS Coding and Inspection forms through automated on demand means? Will the system support a Bridge Management System? Is the work we did on the CRIS program salvageable?

To revise our inventory data as mandated by FHWA in 1995, we will be changing to a different inspection recording system. The bridge portion of the County Road Information System (CRIS) will go away with the mainframe SWIBS system.

The WSDOT Bridge Preservation Office has been building, enhancing, and testing their version of a laptop inspection recording and reporting system. Rhett Miller is the author of the new program written in Microsoft ACCESS '97. The testing has been successful enough for further evaluation. The system was presented to a group of eight local agencies October 21 as part of a pilot program. The pilot program participants are: Spokane, Spokane County, Tacoma, Pierce County, Seattle, King County, Clallam County, Tukwila, and

Lincoln County. During the short pilot test period the program will be evaluated. After the evaluation period, modifications will be recommended to make the program fit the needs of the local agency users. The modifications will then be incorporated into the program and presented for general use.

This does not mean you have to use the electronic forms to update your bridge data. Paper forms will still be available. However, the forms will be slightly different than the old SWIBS forms. For efficiency I hope everyone can perform their inspection electronically. Training will be provided for both methods in the 1999 Bridge Condition Inspection classes.

The County Road Administration Board (CRAB) will help support the program the Bridge Preservation Office has developed and will no longer support the old CRIS Bridge Inspection program. We will provide a two day training class at four locations throughout the state as well as training during our regular bridge inspection training classes. It is hoped the "run time" or the full version of the program can be made available on the TransAid website for downloading to your system. We are working on the details at this time. We are also looking at methods of streamlining the uploading and downloading of the data.

I wish, in some respects, we had more time to prepare for the change; however, keeping two systems maintained for any length of time will be complicated and time consuming.

We will attempt to make the transition as painless as possible. Everyone's cooperation will assist in making a smooth change.

Minimum system requirements are: Pentium, Windows 95, 1024 x 768 small fonts display, RAM at 32 Meg (16 is okay), and ACCESS '97 is optional if you want to make any enhancements to the Bridge Preservation program. Also, a printer capable of printing 11 x 17 paper is desirable for the WSBIS sheet or a "classic" pencil if you want to use paper forms!

The element data that has been stored with the CRIS program can be retrieved, if so desired, as well as any comments stored. John McEachron has a conversion program developed to capture data from CRIS and put it into the WSDOT program. We will be discussing that part of the transition in more detail later. The Bridge Preservation program does support element and condition state data and verbiage. It is a good tool complete with help screens and pull down screens for proper code input selections.

Continued on page 12

WSDOT Bridge Management has been using the WSDOT bridge inspection data in a BMS (Bridge Management System) called BRIDGET to better define the real needs for rehabilitation and replacement. Dewayne Wilson of the Bridge Office is doing the study and will participate in some of the training after the local agencies are up and running.

If you need more information regarding the transition, check the TransAid web page, or e-mail me, Greg Kolle, at kolleg@wsdot.wa.gov or phone (360) 705-7379. •

It's starting! WSDOT and WDFW will be presenting information on the history, procedural requirements, repair techniques, regulatory process, development of general permits for the bridge scour repair process, and to identify ways to make the process more effective.

There are three workshops: December 3, 9, and 15 in Ellensburg, Seattle, and Olympia. There are ten slots in each workshop for local agency representatives to attend. If you have bridge scour mitigation/permit issues and would like to attend, please call Greg Kolle at (360) 705-7379 or Brian Hasselbach at (360) 705-6975. •

PRODUCT ALERT!

Attention County Engineers and Bridge Engineers!

*Greg Kolle, PE, Bridge Engineer
WSDOT-TransAid*

The WSDOT Materials Lab has determined there could be a problem with "Eclipse Shrinkage Reducing Admixture" by GRACE. The Materials Lab has determined that the admixture could have an adverse effect on the freeze thaw durability and scaling resistance of concrete. GRACE, therefore, recommends not incorporating this admixture into concrete subject to freeze thaw cycles until further notice.

If you have questions, please call Bret Simpson, GRACE, at (617) 498-4538 or Greg Kolle at (360) 705-7379.

Technology in Rural Transportation

A recent study documented more than fifty proven, cost-effective, "low-tech" solutions to rural transportation needs, most developed or implemented by local transportation professionals. One of these solutions is outlined below:



Learn all about the simple solutions on the Internet at <http://inform.enterprise.prog.org>

The simple solutions report is available from Hau To at (651) 686-6321, or email: to@crc-corp.com

Radar Detector Activation (Safety Warning System)

Overall goal:	To improve road safety by providing drivers with advance warnings of hazards.
Technical approach:	The system activates any current, commercially available radar detector to warn of a hazard. The basic system emulates the effect of approaching a police vehicle, sounding the detector's K-band alert. It is intended to encourage drivers to slow down prior to encountering a hazard or potentially hazardous situation, such as railroad grade crossing. A more advanced system is being developed which will require enhanced radar detectors and transmitters. The transmitter will be able to issue a variable text message to the detector or activate any of a series of fixed text messages which have been pre-stored in the "smart" detector, giving more precise details of a hazard.
Current status:	Transmitter testing began in November, 1995. Discussions with various state departments of transportation regarding field testing are currently underway. Patents have been filed for the Safety Warning System, and FCC approval to use police radar frequencies is being sought. Marketing of the "smart" detectors commenced in the fall of 1996.
Location / geographic scope:	The system could potentially be deployed in any state where use of radar detectors is legal. Deployment could take place either at site-specific locations, such as at railroad grade-crossings, or on a corridor or region-wide basis.
Agencies involved:	The Safety Warning System is a cooperative effort involving the Radio Association Defending Airwave Rights (RADAR), a national non-profit organization representing those who make, sell, and own radar and laser detectors, and other private organizations. Research and development is being conducted by Georgia Tech Research Institute.



U.S. Department of Transportation
Federal Highway Administration

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Technology in Rural Transportation

Radar Detector Activation (Safety Warning System)

Cost information:

Information is not currently available on costs incurred during the development of the system. It has been estimated that the cost of "non-smart" transmitters for a site-specific application, such as a railroad grade crossing, would be approximately \$500, plus installation costs. Given that the system is capable of activating any of the estimated 10 to 15 million radar detectors currently in use, the system can provide basic warning capabilities at no additional cost to a driver already owning a radar detector.

Key contacts:

Gene Greneker, Georgia Tech Research Institute. (770) 528-7744
Janice Lee, Safety Warning System, L.C. (941) 473-1555

Have goals been achieved?

The system has been developed and successfully tested in non-live situations. Ultimate success of the system depends on FCC approval and market uptake.

Solution timeline:

The implementation time frame depends on the system being granted the necessary FCC approval for use of radar frequencies. Both the "smart" transmitters and receivers are said to be market-ready.



U.S. Department of Transportation
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Biological Assessments... What Are They?

*Brian Hasselbach, Environmental Engineer,
WSDOT-TransAid*

You are all very likely aware of the Endangered Species Act (ESA). What you may have less of an awareness of are its requirements, the issues related to it, and how these issues will affect our transportation projects and activities. The Act itself was created in the 1970s to ensure the conservation of ecosystems vital to endangered and threatened fish, wildlife, and plant species of the United States, as well as the conservation of the species themselves. The Act is enforced through two federal resource agencies. The US Fish and Wildlife Service (USFWS) has jurisdiction over all terrestrial and freshwater species. The National Marine Fisheries Service (NMFS) governs and enforces the listings of the marine species, including most of the Pacific Northwest salmon species. While I am sure that you have heard about the spotted owl and its impacts on the logging industry, and the ramifications of those impacts have certainly been significant to those communities affected, this example of the ESA in action did not include virtually every community in the state. With the recent species listings to the ESA and the proposed listings of salmon across the state, the potential impacts are much broader.



The potential certainly exists for the possible listings and subsequent requirements of the ESA to affect everything we do within transportation. Bridge replacement projects, erosion control, winter sanding, maintenance of gravel roads, work in water, and increased length in permit

processes are all potential areas of concern. In short, the implications of the Endangered Species Act will affect, to some degree, every city street, county road, and state highway project, including maintenance activities.

What will some of those implications include? We currently know that any project within a federal nexus, that is any project with partial or full federal funding, occurring on federal land, or requiring a federal permit, will need a biological assessment to be conducted. The assessment is a tool to ensure, in addition to continued federal funding, the project's compliance with the Endangered Species Act.

The biological assessment is a document that can be utilized to evaluate the potential effects of a project on ESA listed species in the project vicinity. The biological assessment should include the following key components:

- a description of the project, including project location
- a listing of ESA species in the area (the majority of the listings can be obtained from USFWS and NMFS, however, additional lists from state resource agencies should be obtained for a complete listing)
- an evaluation of the potential impacts of the project on the species and habitat
- a "determination of effect" statement
- a development and discussion of conservation measures

In addition to its usefulness in ensuring compliance to the requirements stemming from the ESA, a biological assessment is also very useful in achieving compliance with NEPA (National Environmental Protection Act) for federally funded projects. The assessment is a resource used to identify potential effects a project may have on a habitat and any ESA listed species within that habitat. It is a useful tool in determining the effect a project may have on the surrounding environment, and the subsequent need to consult with USFWS and NMFS, depending on the magnitude of those impacts. •

Performance Graded Binder to be New WSDOT Standard in 1999

WSDOT Material Laboratory

On January 30, 1998, the WSDOT Materials Laboratory hosted the Asphalt Suppliers meeting. This meeting consisted of the Asphalt industry, federal, state, and local agencies officials involved in the use of asphalt in Washington State. Jim Walter, the Construction Materials Engineer, and Dennis Duffy, the Bituminous Materials Engineer, asked the representative of the asphalt industry when they would be ready for full implementation of the Performance Graded binder. Industry stated that they would like full implementation in 1999.

Starting January 1, 1999, the standard binder for Washington State Department of Transportation will be Performance Graded (PG). All asphalt binders will conform to the specification requirements of AASHTO MPI standard specification for Performance Graded Asphalt Binder or as amended.

There are three primary based PG asphalt binders that will be used in Washington State. PG58-22 will be used in western Washington where the ambient temperatures are mild during winter and summer months. PG58-34 will be used in northeastern Washington, from north of Interstate 90 where temperatures are very cold during the winter months and mild during the summer months. PG64-28 will be used in southeastern Washington south of Interstate 90 where the ambient temperatures are very hot during the summer months and moderately cold during the winter months.

If you have any questions about PG binders, please call Dan Dizon, Liquid Asphalt Testing Engineer, at (360) 709-5424. •

Selection of Performance Grade Asphalt Cement. . . What to Consider

What is a Performance grade of asphalt cement?

As part of Superpave, the asphalt binder classification system is completely new. The existing grading systems of viscosity and penetration were replaced with a performance grade (PG) system. The proper PG of asphalt cement is based on two factors: traffic and pavement temperatures. Adjustments are made to the PG grade of asphalt cement based on traffic conditions and traffic volumes, which is intended to enhance the design life of the pavement.

The PG grading system has the general form of PG-XX-XX. It is comprised of two numbers which represent different pavement temperatures. The first number PG 58-XX represents the high pavement temperature in degrees Celsius, while the second number PG XX-22 represents the low pavement temperature. All adjustments to the PG grading system are made in six (6) degree increments. The high temperature relates to the effects of rutting and the low temperature relates to cold temperature and fatigue cracking.

Beginning January 1, 1999, the Washington State Department of Transportation (WSDOT) will be adopting the Performance Graded Binder system. All asphalt binder will conform to the specification requirements of AASHTO MPI Standard Specification for Performance Graded Asphalt Binder or as amended.

Base PG Grades

There are three (3) primary PG grades of asphalt cement that will be used in Washington State. They are as follows:

PG 58-22 will be used in western Washington where the ambient temperatures are mild during both the winter and summer months.

PG 58-34 will be used in northeastern Washington, from Interstate 90 north where the ambient temperatures are very cold during the winter months and mild during the summer months.

PG 64-28 will be used in southeastern Washington from Interstate 90 south where the ambient temperatures are very hot during the summer months and moderately cold during the winter months.

Determining the pavement design life

The pavement design life is determined by calculating the expected ESALs over a 15 year period.

Adjusting the PG Grade for traffic volumes

Adjustments to the PG grade of asphalt cement for the higher traffic volumes may need to be considered. These adjustments should be made when the conditions on the main route or any of the main cross streets are within the limits shown in Table 1.

Table 1 Adjustments for Traffic Volumes	
Traffic Volume	Adjustment
10,000,000 to 30,000,000 ESALs	Consideration should be given to increase the high temperature by 1 grade
Greater than 30,000,000 ESALs	Increase the high temperature by 1 grade

Adjusting the PG Grading for traffic conditions

There will also need to be consideration for making adjustments to the PG grade of asphalt cement for the different traffic conditions. These adjustments should be made when the conditions on the main route or any of the main cross streets are within the limits of Table 2.

Table 2 Adjustments for Traffic Conditions	
Traffic Condition	Adjustment
Standing < 20 km/h (< 10 mph)	Increase the high temperature by 2 grades
Slow Transit 20 to 70 km/h (10 to 45 mph)	Increase the high temperature by 1 grade

The PG grades of asphalt cement that are available for WSDOT use based on the traffic adjustments, are shown in Table 3.

Table 3 Available PG Grades			
Traffic Condition	Western Washington	Northeastern Washington	Southeastern Washington
Fast >30,000,000	PG 58-22 64-22	PG 58-34 64-34	PG 64-28 70-28
Slow >30,000,000	64-22 70-22	64-34 70-34	70-28 76-28
Standing >30,000,000	70-22 same	70-34 same	76-28 same

Adjusting for mountain areas

When determining the grade of PG asphalt cement to be used in the mountain areas, consideration should be given to pick one of the three base grades that best fits the conditions of the roadway that is to be paved. In most cases we should be using a PG 58-34 grade of asphalt cement for all mountain passes. The reason for this is due to the extremely cold winter months and the mild summer months.

Recycled asphalt concrete pavements

The use of recycled asphalt concrete will be allowed in manufacturing asphalt concrete pavements with PG grades of asphalt cement. Up to 20 percent of recycled asphalt concrete pavement will be allowed. This will not require adjustments to the base PG grade of asphalt cement.

If you have any questions regarding the new PG asphalt binder requirements please call Dennis Duffy (360) 709-5420 or Paul Sachs at (360) 705- 7352. •

The Northwest T2 Center Partners with the FHWA Washington Division Office to Develop a Course on Cold In-place Recycling of Asphalt Pavements

By Bryan Cawley, FHWA

Creating the best transportation system in the world requires action. One action item that the Northwest Technology Transfer Center and the Washington Division Federal Highway Administration (FHWA) Office has performed is inter-agency training. The training course, the use of Cold In-place Recycling (CIR) of asphalt pavements, was developed and offered to local agencies and State DOT representatives on September 22, 1998 at the Yakima Valley Museum in Yakima.

CIR has been practiced by various methods and under a variety of names for over half a century. Thanks to cooperation between equipment manufacturers, the petrochemical industry, contractors, and government agencies, great advances have been made. Today, the process combines sophisticated engineering and testing procedures, microprocessor blending controls, specially formulated additives, and highly productive machinery to achieve both an economical and quality road surface. Because of these advances, the CIR rehabilitation process has become a safe, efficient, and effective alternative method of improving part of the world's transportation system.

The increased safety of using the CIR process, instead of conventional mill and fill, is recognized in the construction process. The CIR construction process involves only closing one lane of traffic during construction and compaction versus the traditional method which may require the lane to be closed until new pavement can be placed in the milled out section. The increased efficiency of this rehabilitation process can be seen in the life cycle costs and construction productivity. Finally, this product has an impressive performance history that leads to it being an effective method of rehabilitating medium to low volume asphalt roads.

The inter-agency training was a one day course that covered project selection, material specifications, QA/QC of the construction process, contract administration, economics, environmental restraints, current construction equipment, and additives: Quicklime, emulsions, and water. The instructors were Bryan Cawley, FHWA; Cathy Nicholas, FHWA; James Powell, FHWA; Larry Mattusch, Scott County Engineer, Iowa; Randall Stuart, Chemical Lime Company; Richard Nelson, Valentine Surfacing; Jim Dwyer, WSDOT; Steve Mette, WSDOT and Paul Sachs of the WSDOT Northwest T2 Center. The class was structured so that different perspectives could be offered by each of the instructors.

Bryan Cawley introduced the CIR process and spoke briefly about a number of projects around the country. He reminded people that CIR was not a treatment for all projects, but works as an alternative maintenance selection in many cases. CIR is applicable to any pavement structure, but should be used as an intermediate course, requiring a wearing course or surface treatment. Pavement areas with load related distresses can be selected for CIR if the cause of the distress is corrected before the application of the treatment. James Powell talked on applying appropriate QA/QC testing and procedures. Having proper field inspection and ensuring that the specification is correct will help to avert any potential problems after the CIR has been put on the road. What made this training session unique was the opportunity to hear from a couple of contractors who perform components of the CIR procedure. Richard Nelson of Valentine Surfacing talked about his experiences with CIR. He spoke about the equipment that is used in the process and when the best time of the year would be. In general CIR would be best placed during the summer months when the state of Washington could expect very little moisture. He also referred people to a March 1998 AASHTO document on Cold Recycling of Asphalt Pavements which was included in the course notebook. He felt that if an agency followed the guidelines of the report they would achieve a successful application every time. Randall Stuart, Chemical Lime Company spoke about the benefits of using lime to increase the durability of the CIR pavement. He referred students to an article that appeared in *Roads and Bridges* in January 1988 called "Lime-treated Pavements Offer Increased Durability." The article was also included in the students course notebook. The afternoon sessions were devoted to actual case studies from a recent WSDOT project and from a county engineer from Iowa with quite a lot of experience with CIR.

Since a large percent of our nation's roads are local roads, it was important to introduce CIR to local agencies as an additional tool or alternative method of maintenance to apply on their roadway system. This training shared the knowledge about CIR to about 27 local agency road program administrators as well as 24 WSDOT representatives. This training was well received by the participants. Because of the success of this course, further training courses are expected to be developed between the FHWA Division office in Washington and the Northwest T² Center. These classes will be developed in the next three to six months and offered to local agencies in the spring of 1999.

***Note:** If you were unable to attend the one-day training class in Yakima, but were interested in learning more about Cold In-place Recycling, copies of the manual that was used at the class are available by calling Paul Sachs at the Northwest T² Center. His phone number is (360) 705-7352.*

Also, Bryan Cawley was on a six-month assignment with the FHWA Washington Division Office when he took the lead in developing the Cold In-place Recycling class that was offered to local agencies and WSDOT on September 22. The Northwest T² Center greatly appreciated the effort that Bryan put into developing the class and was very pleased to nurture the partnership with the FHWA. We look forward to working with the Division Office in the future and building upon the success of this class. •

Engineer Develops No-Nail Road Tube Anchoring System

Source: Better Roads, June 1998

"Our agency, in St. Johns County, Florida, like so many others, uses programmable traffic counters with road tubes for traffic detection," says Greg Kennedy, CET, project coordinator for the county's Engineering Division. "While managing the program, I experienced first hand the problems in setting up count stations. Count stations are often located on high-speed, high-volume, collector, and arterial roadways. It's impractical to stop traffic for every count setup; therefore, traffic count personnel must wait for gaps in the traffic stream to span road tubes across the pavement surface."

"Road tubes can be pulled quickly across multiple lanes. However, anchoring the road tube to the pavement was a hazardous and time-consuming task. The road tube had to be anchored at the edge and centerline of pavement using various hardware and case hardened nails driven into the pavement surface. Nails would often ricochet, or would pull loose during a count session. In addition, nails have to be removed with a pry bar after the count session leaving an opening or fracture in the pavement surface."



"Two years ago I developed a no-nail road tube anchoring system using a modified pavement marker as an anchoring device. The road tube anchor contains a socket on the side of the marker for the attachment of fastening hardware. The RTA uses standard traffic hose hardware attached to a resilient spring steel clip. The clip is then inserted into the anchor socket where it locks in place."

"After the count stations are set up with anchors, and the road tubes are fitted with standard hardware, no additional tools — with the exception of a screwdriver — are needed. Road tubes can be moved efficiently from station to station by simply plugging into an anchor. After the count session is over, the road tube can be easily removed by depressing the clip through an opening in the top of the anchor. The benefits of the no-nail anchoring system were quickly recognized by our traffic engineer and have been implemented on the county roadway network." •



Free Publications From Your T² Center

For Washington residents only.

Name _____

Agency _____

Address _____

City and Zip _____

Phone _____

Check the items you would like to order.

- _____ Current Application and Successful Implementation of Local Agency Pavement Management in the United States, FHWA, 1997
- _____ Scrap Tire Utilization Technologies, NAPA
- _____ State-of-the-Art Survey of Flexible Pavement Crack Sealing Procedures in the United States, CRREL, 1992
- _____ Maintenance of Aggregate and Earth Roads, NWT² Center (1994 reprint)
- _____ International State-of-the-Art Colloquium on Low-Temperature Asphalt Pavement Cracking, CRREL
- _____ The Engineer's Pothole Repair Guide, CRREL
- _____ Geotextile Selection and Installation Manual for Rural Unpaved Roads, FHWA
- _____ Guide to Safety Features for Local Roads and Streets, FHWA, 1992
- _____ Family Emergency Preparedness Plan, American Red Cross, et al.
- _____ Getting People Walking: Municipal Strategies to Increase Pedestrian Travel, Rhys Roth, Energy Outreach Center
- _____ The Superpave System – New Tools for Designing and Building More Durable Asphalt Pavements, FHWA
- _____ A Guide to the Federal-Aid Highway Emergency Relief Program, USDOT, June 1995
- _____ Asphalt Seal Coats, T² WSDOT
- _____ Pothole Primer — A Public Administrative Guide, CRREL, 1989
- _____ Redevelopment for Livable Communities, Rhys Roth, Energy Outreach Center
- _____ A Guidebook for Residential Traffic Management, NWT² Center, 1994
- _____ A Guide for Student Pedestrian Safety, KJS, 1996
- _____ A Guide for Local Agency Pavement Managers, NWT² Center, 1994
- _____ Local Agency Pavement Management Application Guide, NWT² Center, 1997
- _____ Positive Guidance and Older Motorists — Guidelines for Maintenance Supervisors, Texas A&M
- _____ Planning, Design, and Maintenance of Pedestrian Facilities, FHWA, 1989
- _____ Traffic Calming: A Guide to Street Sharing
- _____ Basic Metric System, WSDOT
- _____ The Impact of Excavation on San Francisco Streets. This study evaluates the impacts utility cuts have done to the street and road network. September 1998

Workbooks and Handouts From T² Center Workshops

- _____ Metric (SI) Training for Highway Agencies, FHWA, 1993
- _____ Roadside Safety Features, WSDOT, 1997
- _____ Access Management, Location and Design, FHWA/NHI, 1998
- _____ Access Management Guidelines for Activity Centers, NCHRP Report 348, TRB/NRC, 1992
- _____ Handbook for Walkable Communities, by Dan Burden and Michael Wallwork
- _____ Geosynthetic Design and Construction Guidelines, National Highway Institute
- _____ Construction of Portland Cement Concrete Pavements, FHWA, 1996
- _____ Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas, TRB
- _____ Rockfall Hazard Mitigation Methods, FHWA, 1994
- _____ Part VI, Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations. Handbooks included: Quality Standards for Work Zone Traffic Control Devices and Flagging Handbook, FHWA, 1993
- _____ Historic and Archeological Preservation: An Orientation Guide, FHWA/NHI
- _____ Partnering Concepts, FHWA/NHI

Self-Study Guides

The following noncredit self-study guides are available through WSDOT Staff Development and can be obtained from the T² Center. An invoice will be sent with the books.

- _____ Technical Mathematics I, \$20
- _____ Technical Mathematics II, \$20
- _____ Contract Plans Reading, \$25
- _____ Basic Surveying, \$20
- _____ Advanced Surveying, \$20

**Orders may be faxed, mailed,
or phoned to Laurel Gray**

Phone: (360) 705-7386,

Fax: (360) 705-6858

Mailing Address: NWT² Center,
WSDOT/TransAid, P.O. Box 47390,
Olympia, WA 98504-7390

Computer Programs

The following computer programs may be downloaded from the Internet at <http://www.wsdot.wa.gov/TA/T2/computer.htm>

Design Cost Estimate. A software database program that calculates cost projections based on standard items.

Materials Approval Tracking. A software program designed to track materials data, need, status, and approval of any materials sampling and documentation needed for approval.

HyperCalc. A shareware utility for converting between metric and English units.

Force Account Macros. A series of ready-made Excel spreadsheets and macros to save you time on daily force account calculations and reports, including wage and equipment rates.

APWA CAD Symbol Standards and Menus. A public domain program of standard AutoCAD symbols developed by the Washington Chapter of APWA for use with AutoCAD release 12.

Microsoft Access Runtime Program. Assists in running the Materials Approval Tracking and Design Cost Estimate Program.

UTEC System. A software program consisting of a main menu designed to provide a record base for identifying street locations within an agency.

Opportunities to Enhance Your Skills

For more information, contact the training provider listed. For additional training needs contact the Northwest T² Center at (360) 705-7386 or 1-800-973-4496.

<http://www.wsdot.wa.gov/TA/T2/T2HP.htm>

Workshops

NWT² Center, WSDOT, Laurel Gray
(360) 705-7386, Fax (360) 705-6858
<http://www.wsdot.wa.gov/TA/T2/train.htm>

Check our web pages for the most current and up-to-date training information. Classes are added often and is the most current source of training information through the T² Center.

Bridge Classes (No fee)

Bridge Inspection Fundamentals

February 1-5, 1999 Lacey

Inspection Reporting Update

February 8-9, 1999 WSDOT Mats Lab, Tumwater

February 11-12, 1999 Yakima

April 12-13, 1999 Everett

April 15-16, 1999 Spokane

WSBIS Coding

February 22-25, Lacey

Bridge Inspection Training

March 8-12, 1999 and

March 22-26, 1999 (2 weeks) Lacey

Washington Quality Initiative (WQI) Training (No fee)

April/May 1999, 4 hours

Series of workshops around the state. Katherine Klockenteger/Pat Morin, WSDOT Instructors

Roundabout Training

8 hours. No fee

Darlene Sharar, Instructor

April 7, 1999 Seattle

April 21, 1999 Olympia

May 5, 1999 Everett

May 19, 1999 Vancouver

June 2, 1999 Yakima

June 16, 1999 Spokane

June 30, 1999 Walla Walla

Delcer Workshops (No fee)

Dale Keep, Instructor 8 hours. Late spring. Approximately 6 locations around the state: Seattle, Olympia, Vancouver, Yakima, Spokane, Walla Walla

Self-Study Guides Available

The following noncredit self-study guides are available from WSDOT's Staff Development office and can be obtained from the T² Center. An invoice will be sent with books.

- Technical Mathematics I – \$20
- Technical Mathematics II – \$20
- Contract Plans Reading – \$25
- Basic Surveying – \$20
- Advanced Surveying – \$20

WSDOT, Staff Development
Local Agencies should call Laurel Gray
in the T² Center to register
(360) 705-7386

Limited number of openings in the following classes. Names can be put on request list for future classes.

Asphalt Concrete Pavement Testing Procedures (BG9)

March 31-April 1, Spokane.

Asphalt Paving Street Inspection (ACB)

December 10, Yakima; January 20, Vancouver; March 30, Spokane; April 28, Seattle.

Bituminous Surface Treatment Inspection (ACC)

April 14, Spokane.

Drainage Inspection (ACF)

December 9, Spokane; January 21, Vancouver; March 9, Seattle.

Electrical-Illum and Signals (API)

December 16-17, Spokane; January 26-27, Chehalis; May 18-19, Seattle.

Excavation and Embankments Inspection (AC3)

March 3, Spokane; March 24, Seattle.

Miscellaneous Document (ACY)

December 3, Vancouver; December 15, Yakima; April 7, Seattle; April 21, Spokane.

Nuclear Gauge, Embankment/Surfacing/Pavement Applications (ANQ)

March 18, Spokane; May 5, Seattle.

Nuclear Gauge, Operator Qualification (ALG)

March 17, Spokane; May 4, Seattle.

Nuclear Gauge, Overview for Supervisors (ANE)

March 16, Spokane.

PCC Field Testing Procedures (ABT)

February 10, Spokane; February 16, Vancouver; March 14, Seattle.

WSDOT, Environmental Affairs Office
Contact Jim Sundahl

(360) 705-7483, Fax (360) 705-6833

Certification in Construction Site Erosion and Sediment Control (\$125)

January 5-6, Thurston County

January 26-27, Clark County

February 9-10, Pierce County

February 23-24, King County

March 9-10, Ellensburg

March 23-24, Spokane

April 7-8, Skagit County

April 20-21, Kitsap County

University of Washington Professional Engineering Practice Liaison (PEPL)
(206) 543-5539, Fax (206) 543-2352
<http://www.engr.washington.edu/~uw-epp/Pepl/peplcal.html>

Prices denote early registration/late registration.

Wetlands Ecology, Protection and Restoration.

December 15-17 \$435/\$475

***Storm and Surface Water Monitoring**

January 12-13 8:30 a.m. - 4:30 p.m.
\$345/\$375

***New Technologies and Concepts in Stormwater Treatment**

February 10-11 8:00 a.m. - 5:00 p.m. \$345/\$375

How to Successfully Use Value Engineering for Capital Projects

February 17-18 8:30 a.m. - 4:30 p.m. \$345/\$375

Effective Writing for Technical Professionals

February 25 and March 2, 4, 9 and 11, (five sessions): 3:30 - 6:30 p.m.
\$320/\$345

***Alternative On-Site Stormwater Management Techniques**

March 25-26 8:30 a.m. - 4:30 p.m.
\$345/\$375

***Stormwater Treatment by Media Filtration**

April 7-8 8:30 a.m. - 4:30 p.m.
\$345/\$375

Quaternary and Engineering Geology of the Central and Southern Puget Sound Lowland

April 15-17 8:30 a.m. - 4:30 p.m.
\$380/\$420

***Design and Retrofit of Culverts for Fish Passage in the Northwest**

May 12-13 8:30 a.m. - 4:30 p.m.
\$345/\$375

***Fundamentals of Urban Surface Water Management**

June 8:30 a.m. - 4:30 p.m.
\$345/\$375

***Use of Constructed Wetlands for Improving Stormwater Quality**
September 8-9 8:30 a.m. - 4:30 p.m.
\$345/\$375

Basics of Project Management for Design Professionals

September 14, 16 and 21 (three sessions): 4:00 - 6:30 p.m.
\$185/\$210

***Stormwater Treatment: Chemical, Biological & Engineering Principles**

Sept. 15-16 8:30 a.m. - 4:30 p.m.
\$345/\$375

***Part of the Urban Surface Water Management Continuing Education Program**

TRANSPPEED, University of Washington
Call Julie Smith
(206) 543-5539, Fax (206) 543-2352
<http://www.engr.washington.edu/~uw-epp/Transpeed/index.html>

Prices shown are for public employees/others. Contact UW for more details, or call (360) 705-7386 for a brochure.

Stormwater Engineering for Transportation Professionals

January 5-7, Seattle. \$180/\$350

Public Works Construction Project Management

January 11-12, Vancouver. \$210/\$360

Construction Inspection of Public Works Projects.

January 14-15, Vancouver. \$150/\$300

Managing Project Delivery.

January 20-22, Seattle. March 2-4, Vancouver. \$750/\$950

Legal Liability for Transportation Professionals.

March 10-11, Seattle. \$150/\$300

Manual on Uniform Traffic Control Devices.

Jan 26-28, Lacey. \$240/\$410

Roadway Value Engineering.

February 3-5, Lacey. \$180/\$350

Traffic Calming: Techniques and Management.

February 18-19, Seattle. \$150/\$300

Basic Roadway Geometric Design.

February 10-12, Lacey. \$180/\$350

Hydrology and Basic Hydraulics.

March 18-19, Seattle. \$150/\$300

Traffic Engineering Tools and Procedures.

March 25-26, Seattle. \$150/\$300

Design and Application of Roadway Safety Features.

March 30-April 1, Seattle.
\$180/\$350

American Public Works Association (APWA)
(816) 472-6100, ext. 3534
Contact Shirley Calandra

APWA Videoconferences – 1999

February 17: Preventing Excavation Damage: What You Can't See Can Hurt You

April 14: TEA 21: Implementation at the Local Level

June 16: Strategies for Addressing Environmental Liability

August 18: Moving Roadway Maintenance into the 21st Century

October 20: Managing Change in Local Government: Removing the Fear Factor

December 8: Using Risk Management to Protect Investments

Washington State Department of Personnel (DOP)
(360) 664-1921
<http://www.wa.gov/dop/edtp/pages/contents.htm>

The following is a partial list of classes available to local governmental agencies based on space availability. Many computer classes are available but too numerous to

Continued on page 24

list. Contact DOP for their latest catalog and registration information.

Achieving Extraordinary Customer Relations - \$200

Olympia: January 13-14,
April 14-15, May 12-13.
Tacoma: March 10-11.

Budgeting for the Non-Financial Manager - \$80

Olympia: March 11-12, June 17-18.

Cardiopulmonary Resuscitation N/C

Olympia: January 27, April 13.

Designing Effective Training Programs: Train the Trainer - \$175

Olympia: December 2-4, February 22-24, May 24-26.

Entry Management Development Core Program Phase 1 - \$100

Olympia: December 7-10, January 5-8, February 2-5, February 16-19, March 9-12, April 20-23, May 11-14, June 21-24.
Seattle: May 3-6.
Spokane: April 6-9.
Tacoma: Dec 8-11, June 14-17.
Vancouver: March 23-26.
Wenatchee: January 11-14.
Yakima: November 16-19.

Entry Management Development Core Program Phase II - \$95

Olympia: December 14-16, February 24-26, May 19-21.
Tacoma: March 16-18.

First Aid, Basic (2 Days) - \$35

Olympia: January 11-12,
March 8-9, May 3-4, June 14-15.

Internet-Based Writing for Results - \$165

Olympia: March 18-May 18.

Internet: Creating Agency Web Pages Using UTML Level 1 - \$110

Spokane: December 8.

Internet: Introduction - \$99

Tacoma: December 10, January 8, 22, February 9, March 5, 19, April 2, 20, May 10, 28, June 25.

Sexual Harassment Awareness and Prevention - \$40

Olympia: March 3, May 5.

Evergreen Safety Council
401 Pontius Avenue North
Seattle, WA 98109 (206) 382-4090
1-800-521-0778
<http://www.esc.org/ecourse.html>

Industrial Insurance/Workers' Compensation (SPT113X) \$165/\$195

Spokane: December 7.
Salem: December 14.

Safety Committee Requirements and Planning, Preparing and Conducting Safety Meetings (SPT106AB) \$165/195.

Salem: January 18.

Fire Safety/Emergency Response (SPT114AB)

Seattle: December 3. \$165/195.

Flagger Instructor Certification (ITFG004)

Seattle: December 7-8. \$355/395.

Traffic Safety/Office Safety (SPT115AB)

Seattle: December 10. \$165/195.

Accident Investigation/Safety Inspections (SPT107AB)

Olympia: December 14. \$165/195.

Injury/Illness Prevention Program/Hazard Comm. (SPT101AB)

Seattle: January 7. \$165/195.

Safety Science-Math (HST201)

Seattle: January 12, January 19.
\$195/235.

Personal Protection Equipment/Materials Handling (SPT109AB)

Olympia: January 25. \$165/195.

Job Safety Analysis/Job Instruction Training (SPT102AB)

Seattle: January 21. \$165/195.

Conferences/Meetings

<http://www.wsdot.wa.gov/TA/T2/conf.htm>

36th Road and Street Maintenance School - West.

December 9-11, Bellevue.
Information: WSU Conferences and Institutes (509) 335-3530, 1-800-942-4978, fax (509) 335-0945, e-mail wsuconf@wsu.edu.

NW Concrete Pavement Seminar

March 8-9, 1999. Information: WSU Conferences and Institutes (509) 335-3530, 1-800-942-4978, fax (509) 335-0945.

50th Annual Road Builder's Clinic

March 9-11, 1999, Coeur d'Alene, Idaho. Information: WSU Conferences and Institutes (509) 335-3530, 1-800-942-4978, fax (509) 335-0945.

ITS 99 - ITS America Ninth Annual Meeting

April 19-22, 1999, Washington Marriott Wardman Park Hotel, Washington, DC.

APWA's Annual Conference "1999 International Public Works Congress and Exposition"

September 19-22, 1999, Denver, Colorado. Contact Cheryl McOskey at (816) 472-6100 x 3521 or e-mail cheryl.mcoskey@mail.pubworks.org.

International Conference on Accelerated Pavement Testing

October 18-20, 1999, Reno, Nevada. First announcement and call for papers. Information: Maria Ardila-Coulson, Director, Nevada T2 Center/257, University of Nevada, Reno, NV 98557, Phone (702) 784-1433, fax (702) 784-1429, e-mail maria@unr.edu.

An Introduction to "Roundabouts"

*Darlene Sharar,
Technology Transfer Engineer
WSDOT-NWT² Center*

- Roundabouts - will they **Really** work?
- Roundabouts - are they just the newest **Craze**?
- Roundabouts - how can they be **Safe** for motorists?
- How can pedestrians **Safely** cross a constantly moving stream of traffic?

I am sure that if you have heard of a roundabout, these might be a few of the questions that you have pondered. For those of you who have not yet heard of roundabouts, not to worry, the next few articles will help you to learn about them and decide if they are an option that you wish further information on!

Terminology to distinguish traffic circles and **modern roundabouts** is confusing to say the least. Consistent terminology has not yet evolved for this type of traffic

control option. The term "Roundabout" or "Modern Roundabout" has been used in reference to this improved version of the old "Traffic Circle." You will see the term "Roundabout" and/or "Modern Roundabout" in many publications. In the past, circular forms of traffic control were termed "Traffic Circles."

Here in the US, traffic circles and modern roundabouts are often seen as the same unpleasant device. Although their conceptual origins are similar and both appear to function in a like manner in that they both bring intersecting roadways to a circular roadway verses a cross intersection, how each controls the traffic within the circular roadway and how they are designed are very different from one another.

There are many differences between "Modern Roundabouts" and the old style of "Traffic Circles." Roundabout drivers **yield** upon entry to traffic in the roundabout. Traffic circle drivers yield to entering traffic — causing gridlock. Roundabouts use yield upon entry for traffic control. Traffic circles can employ a mixture of stop, yield, and signal control. Roundabout entry speeds are kept **low**, most entry speeds are less than 25 mph and drivers are not allowed to enter straight into the round-



City of University Place. Washington's first modern roundabout.

Continued on page 26

about. Accidents in roundabouts are either the “side swipe” or “rear-end” varieties, at low speeds. Some larger traffic circles provide straight paths and allow for higher speeds, which is the main cause for “T-bone” type accidents. Later articles will have some in-depth discussion on the differences between roundabouts and traffic circles.

Well-designed roundabouts have proven to be safe and efficient forms of intersection control in the countries that have adopted **modern** guidelines. These countries include Great Britain, Australia, France, Germany, Spain, Norway, and the Netherlands, among others.

The standards in WSDOT’S upcoming manual are a compilation of existing roundabout design tools from other countries and states. WSDOT has taken the approach of not “reinventing the wheel” where roundabouts are concerned. Research has been done and procedures that WSDOT wishes to utilize are being incorporated into the Roundabout Design Manual currently in development. It is expected that this manual will evolve as designers, inspectors, traffic engineers and maintenance personnel learn what options work best with respect to roundabouts.

With regard to intersection control options, WSDOT is of the opinion that “Roundabouts” are one more tool to be considered when attempting to decide which form of traffic control device will best suit a specific situation. In no way does the upcoming “Roundabout Design Manual” suggest that roundabouts are the best or only solution to intersection control.

The Manual will provide methodology for deciding if a “Roundabout” is a proper choice for traffic control. Appropriate and inappropriate site selection processes will be provided. Estimating roundabout capacity and delay methods will be shown. Design standards and principals will be outlined for several types of roundabouts. Operational features such as signing, pavement marking, illumination, landscaping and maintenance will be discussed as well as encouraging uniformity in the design of roundabouts across Washington State. Each of these items will be in future T2 Center Bulletins!

Again, briefly the aim of the guide is:

- to give guidance on the selection of appropriate sites for roundabouts.
- to provide guidance for the geometric layout of roundabouts.
- to encourage uniformity in the design of roundabouts.

- to describe methods for assessing the performance of a roundabout in terms of safety, capacity and delays.

If you would like further information on roundabouts, please contact me, Darlene Sharar, at (360) 705-7383 or E-mail - sharard@wsdot.wa.gov. •

Meta...What?!

*Roger Chappell, Technology Integration Specialist
WSDOT-NWT2 Center*

What is Metadata? In it’s simplest terms *Metadata* is data about data.

The USGS defines *metadata* as: the content, quality, condition, and other characteristics of data. In this era of rapid data exchange, and heavy organizational investment in data infrastructure, *metadata* is quickly becoming a key to protecting your data from misuse and safe guarding it’s longevity through time and personnel changes.

Metadata is the *what, who, how, why* and *where* of your data.

- **What** is the data you have collected? A brief summary of data elements.
- **Who** is the contact person, and the responsible party for maintenance? This is both general and data element specific.
- **How** was it collected, what procedures or equipment were used? How accurate is it and to what resolution. This will be very important to the end user to evaluate whether your data will be useful to their application. Specify equipment makes, models, and modes of operation for the equipment. If your data is derived from other data sources, how was the source data created, and how did you use it. The more information you have available the better. This will help the end user to make intelligent decisions about the use of your data, and will help to safe guard it from misinterpretation.
- **Why** was it collected? **What** is the purpose of this data, ?
- **Where** is it located physically, digitally, and geospatially?

These concepts can be applied to a variety of functions such as taking photos, writing software programs, creating maps to display data, and creating of databases. You know why you did what you did, and metadata is the vehicle to

Continued on page 27

convey that knowledge to others. Any metadata is better than none, and the more well defined and documented the better.

Eventually, your data will be incorporated with other data and displayed graphically in a Geographic Information System (GIS). As GIS continues to grow, the demand for data will increase and more management decisions will be made based on this new hybrid data. Your answers to these questions will help assure that your data is being used appropriately in the decision making process.

Also, having good metadata will ease the transition during a staff change and assure continuity in your program. Have you ever been faced with personnel changes, and the person who left was the only one who knew the real inter workings of the job, or in this case a database? Well documented metadata on your hard-earned data can make the difference between having fully reliable information when the person who manages it leaves or not.

There are standards for the exchange of geospatial metadata for GIS purposes. Here are a few useful websites to help guide you through the creation of your own metadata. Just remember that metadata is simply "data about your data," and in this case "more is better":

- *FGDC's (Federal Geographic Data Committee),*
<http://www.fgdc.gov>

The FGDC coordinates the development of metadata standards for GIS data in support of the National Spatial Data Infrastructure (NSDI). The NSDI encompasses policies, standards, and procedures for organizations to cooperatively produce and share geographic data. There are 16 federal agencies that make up the FGDC in cooperation with organizations from state, local and tribal governments, the academic community, and the private sector. The FGDC's *Content Standard for Geospatial Metadata* is available through their site. Many state and local agencies are beginning to produce metadata according to this standard.

- *Geospatial Data Clearinghouse Entry Point,*
<http://130.11.52.178>

The Geospatial Data Clearinghouse is a collection of over 50 spatial data servers, primarily in North America, that have digital geographic data primarily for use in Geographic Information Systems (GIS). This data collection can be searched through a single interface based on their descriptions or "metadata."

Through this entry point you can discover and access geospatial data resources at the many Clearinghouse sites.

- *The Washington State Geospatial Clearinghouse,*
<http://metadata.gis.washington.edu/>

Through this resource you will be able to discover what spatial information is viable for Washington State or for other geographic entities.

- *Metadata and WWW Mapping Home Page,*
<http://www.blm.gov/gis/nsdi.html>

This award winning site is a gold mine of resources. It features metadata, and covers GIS, and GPS and many other data related issues.

For information regarding Washington State Department of Transportation's metadata and data exchange formats please contact: Gordon Kennedy (360) 705-7641 or kennedg@wsdot.wa.gov



Title: Narrows Bridge
SR - 016

Location: SRMP 7.28

Coordinates: W 122 degrees 32.7

Description: Shot was taken from the East side of the bridge looking West.

Condition: Cloudy and overcast

Date Taken: 11/11/98

Bridge No. 85740P

Control Section: 2704

Notes: Some rust beginning to show, needs sandblasting and sealing.

Linear Referencing Systems

From: Resource Guide on the Implementation of Linear Referencing Systems in Geographic Information Systems (CD-ROM)

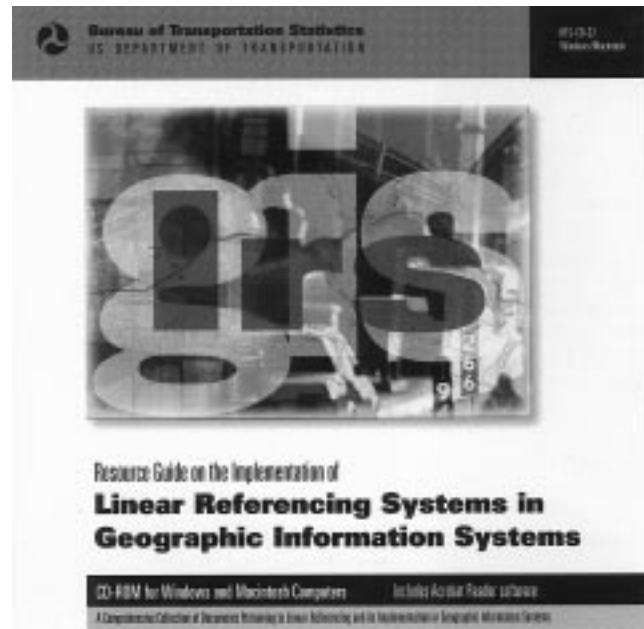
Linear referencing is a means of identifying a location on a linear feature, such as a road or railroad. It provides a means by which people can communicate an understanding of location. An address such as 235 Main Street is a linear reference. Three miles north of the junction of Routes 1 and 50 on Rt. 1 is another linear reference.

Many types of linear references have developed over the years as people have attempted to communicate about roadways and locations on roadways. In early years, there was little need to standardize the means of communicating about location; as long as there was a common understanding of the area, locations could be referenced with common landmarks, such as, "the accident occurred down by Earl's Garage." But as the U.S. highway network grew and became recognized as an infrastructure that needed to be inventoried, maintained and managed, a need to standardize reference locations along the highway grew as well. Linear referencing systems accommodate this need.

A linear referencing system (LRS) incorporates a linear location reference plus the commonly understood meaning of the references and the field data (markers or house numbers) that allows for actual identification of the reference in the field. A system requires not only a common understanding of how to refer to a location, but also a means to identify the location in the real world. For example, an address is meaningless as a linear location reference if there are no house numbers posted and there is no common means (such as a map) to communicate the location and names of streets.

Transportation agencies adopt linear referencing systems to communicate with others about events occurring on the highway system. These events may include information about poor pavement condition or the need for roadside mowing, or they may also include incidents such as crashes or breakdowns or spills. LRS may be used to assign crews to snow plowing routes or to send a highway patrol car out to a vehicle that has broken down. With a linear referencing system in place, a motorist on the road

can report his/her location or find a location. It allows a motorist or transportation official to answer the questions 'Where am I?' and 'How do I get there?' (Deighton et. al., 1994). With the development of geographic information systems (GIS), transportation agencies have found another reason for implementing and maintaining a linear referencing system to visualize event information and perform spatial analysis on maintenance and management data.



For additional information, the Bureau of Transportation Statistics has just made available, at no cost, a new CD-ROM. The resource guide, *Resource Guide on the Implementation of Linear Referencing Systems in Geographic Information Systems*, is a wealth of useful information. The CD includes over 100 documents on LRS models, implementation applications, reference manuals, and research papers. It also includes topical overviews on the subjects included on the disk along with links to the related documents on the disk, a keyword search capability, as well as direct Internet links to websites with related information.

If you would like a copy of the CD you can order yours by contacting the Bureau of Transportation Statistics at (202) 366-3282 or e-mail orders@bts.gov. •

New Videos for T² Library

Contact Laurel Gray at (360) 705-7386 to borrow any of these new tapes.

The following 28 new tapes have been added to the T² Audio Visual Library. A new and updated catalog will be mailed around January 1999; however, in the meantime feel free to borrow any of the following tapes now. A number of videos have been deleted from the catalog and if you want to make changes in your current catalog see below for the deleted numbers. If you have lost your catalog or need another call the T² office at the number above and one can be sent to you.

Due to high purchase costs there are limited copies available for loan if a tape is copyrighted. Non-copyrighted tapes are reproduced and many copies are available. Please be patient if the tape you request is out of stock. Your name can be placed on a list for the next availability.

#366 Snow and Ice Control, WSDOT 1997

Part 1: Prepare for Snow and Ice - 12 Minutes
Part 2: Checking the Equipment - 14 Minutes
Part 3: Plowing and Sanding - 20 Minutes

Planning for the worker and supervisor, overall equipment checks, overall and in-depth equipment adjustments and techniques used during snow and ice control, plowing, and sanding.

#367 Defensive Driving - A Crash Course

Coastal Training Tech. (Copyrighted) 16 Min.
Be a better, safer driver by driving defensively, recognizing hazards, staying alert. Good refresher.

#368 Safety Orientation - Don't Be A Zombie

Coastal Training Tech. (Copyrighted) 22 Min.
Tape covers the key critical safety information needs and motivates workers to take care.

#369 Chainsaw Safety - Safety is No Accident
Coastal Training Tech. (Copyrighted) 20 Min.
Field demonstration of the proper use of chainsaws. All basics covered.

#370 Pro-Active Safety in Action - Accidents Don't Have to Happen

Coastal Training Tech. (Copyrighted) 22 Min.
On-site stories of organizations who are using the "pro-active safety process" to help motivate employees.

#371 Bloodborne Pathogens for Heavy Industry
Long Island Productions (Copyrighted) 24 Min.
Video for workers who may come in contact with blood, including pre-cautions to reduce contact.

#372 Respirator Safety Update
Long Island Productions (Copyrighted) 21 Min.
Explains and shows the correct use and care of respirators of all types.

#373 H-Series Motor Grader-Operator Techniques
Caterpillar, Inc. (Copyrighted) 30 Minutes
Operating techniques of modern articulated motor grader under actual working conditions.

#374 Backhoe-Loader Operating Tips
Caterpillar, Inc. (Copyrighted) 37 Minutes
Operating tips of modern backhoe-loaders under actual working conditions.

#375 Medium Size Wheel Loader Operator Orientation and Training
Caterpillar, Inc. (Copyrighted) 27 Minutes
Operator orientation and training of modern articulated medium size wheel loaders and material handlers under actual working conditions.

#376 H-Series Motor Grader - In-Snow Removal Application
Caterpillar, Inc. (Copyrighted) 21 Minutes
Operator techniques during snow removal application, of modern articulated motor graders under actual snow removal working conditions.

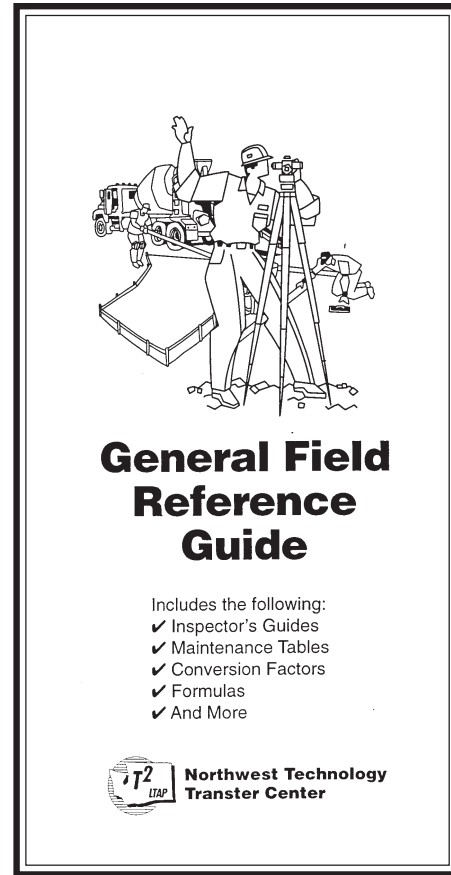
Continued on page 30

- #377 Roadway Design: Balancing Safety, Environment, and Cost**
Minnesota Local Roads Research Board, 14 Min.
Overview of safety, environment protection and cost (both initial construction, and long-term maintenance). The importance of weighing these three factors to benefit the public.
- #378 How Attachments Improve Backhoe Loader Versatility**
John Deere (Copyrighted) 15 Minutes
Shows how different attachments can be used to improve versatility of backhoe loader. Innovative attachments are discussed: multi-purpose bucket, quick mounting coupler, brooms, forks, booms, compactors, and post drivers.
- #379 Traffic Control: What Works**
Minnesota Local Roads Research Board, 12 Min.
Motivate public officials to trust their engineers to develop reasonable, research-based traffic control strategies.
- #380 Dump Truck Safety**
Long Island Productions (Copyrighted) 16 Min.
Explains dump truck safety. For new as well as experienced operator.
- #381 Truck Driving - Controlling Skids**
Long Island Productions (Copyrighted) 17 Min.
Explains/demonstrates skid control for all truck driving. For all skill levels.
- #382 Protecting Our Pavement - Preventive Maintenance**
AASHTO/FHWA, 14 Minutes
Explains need for pavement preventive maintenance in an excellent manner. Shows cost saving by using a well thought out preventive maintenance program, funding for, and execution of program.
- #383 Pro's Guide to Riding Mower Safety**
Long Island Productions (Copyrighted) 19 Min.
Covers most operation safety aspects of riding mower operation. An asset for all levels of experience.
- #384 Crane Safety**
Long Island Productions (Copyrighted) 17 Min.
Video shows most safety related items needed when operating a crane.
- #385 Landscape Power Tools**
Long Island Productions (Copyrighted) 20 Min.
Covers safety precautions that must be considered when using chainsaws, trimmers, blowers. Notes safety equipment: chaps, safety glasses, hearing protection, gloves, etc.
- #386 Killer Bees, Wasps, and Spiders**
Long Island Productions (Copyrighted) 37 Min.
Video provides excellent overview of the measures to take when encountering bees, wasps, and spiders.
- #387 Highway Work Zone Safety - Grading Safety**
Iowa Department of Transportation, 14 Min.
Video covers some of the safety hazards encountered on typical grading site. Emphasis on personal responsibility for safety and awareness of hazards.
- #388 Highway Work Zone Safety - Traffic Control Safety**
Iowa Department of Transportation, 11 Minutes
Video shows how to be safe by following simple, logical procedures for setting up traffic controls. Describes the most common work zone accident: the rear-ender.
- #389 Utility Cut Repair - Doing it Right**
Minnesota Local Roads Research Board, 11 Min.
This video shows how everyone benefits from quality workmanship and use of research-tested materials and methods: saves time and headaches, saves money and gives driving public a smooth, comfortable ride.
- #390 Call Two Days Before You Dig**
Utilities Underground Location Center, 10 Min.
Explains the reasons for calling Utilities Underground Location Center prior to digging. Having underground utilities located and marked prior to digging saves everyone time and money.

- #391 Dump Truck Safety - Maintenance and Operation**
Long Island Productions (Copyrighted) 15 Min.
Covers maintenance and operation of several different dump trucks. For new and experienced operator.
- #392 Fall Protection**
Long Island Productions (Copyrighted) 20 Min.
Covers fall protection in an in-depth manner.
Covers new 1998 regulations. This tape should be viewed by all workers who must work six feet above the ground.
- #393 Boom Arm Mower Safety**
Tiger Corporation (Copyrighted) 16 Minutes
Good overview of boom arm mower operation and safety.

Deleted Tapes:

9, 10, 13, 14, 26, 41, 72, 84, 88, 90, 91, 108,
109, 124, 125, 128, 144, 157, 163, 164, 165,
166, 167, 168, 169, 172, 173, 174, 199, 201,
203, 205, 232, 253, 258, 273, 299, 315



Now Available

Cost: \$2.75 each

Each Washington local agency will be sent complimentary copies. Additional guides are available for ordering from the T2 office. Use order form below.

General Field Reference Guide — \$2.75 each

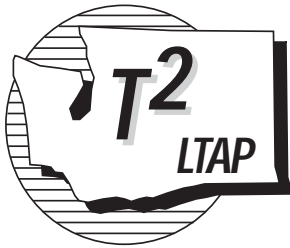
To order your Field Guides, specify quantity desired and enclose check made payable to WSDOT/T2 Center. Questions?
Call (360) 705-7386.

Name _____
Agency _____
Address _____
City/Zip _____
Phone _____

Total number Field Guides requested _____.

Mail to:

WSDOT/T2 Center
Attn: Laurel Gray
PO Box 47390
Olympia, WA 98504-7390



Northwest Technology Transfer Center
WSDOT-TransAid Service Center
P.O. Box 47390
Olympia, WA 98504-7390

Address Correction Requested

NW T² Advisory Committee

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Gary Armstrong
Public Works Director
City of Snoqualmie, (425) 888-1555

Randy Hart
Grants Program Engineer
County Road Administration Board
(360) 586-7586

Phil Barto, Maintenance Engineer
Spokane County, (509) 324-3429

Tom Rountree, Supervisor
King County Public Works
(206) 296-8100

Craig Olson
Entranco
(360) 709-0301

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City of Leavenworth
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(360) 705-7383

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(360) 705-7385

Fax
(360) 705-6858

T² Web Site
<http://www.wsdot.wa.gov/TA/T2/T2HP.htm>

Toll Free Training Number
1-800-973-4496



Issue Number 60, Fall 1998

The Local Technical Assistance Program (LTAP) is a national program financed by the Federal Highway Administration (FHWA) and individual state transportation departments. Administered through Technology Transfer (T²) Centers in each state, LTAP bridges the gap between research and practice by translating state-of-the-art technology into practical application for use by local agency transportation personnel.

Any opinions, findings, conclusions, or recommendations presented in this newsletter are those of the authors and do not necessarily reflect the views of WSDOT or FHWA. All references to proprietary items in this publication are not endorsements of any company or product.



Washington State
Department of Transportation
TransAid Service Center



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